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(54) **Battery pack**

Batteriepack

Bloc-batteries

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Description

Background

1. Field

[0001] The present invention relates to a battery pack.

2. Description of the Related Art

[0002] In general, unlike a primary battery, which is not designed to be recharged, a secondary battery is capable of being repeatedly charged and discharged. A low-capacity secondary battery composed of a single battery cell is used as a power source for various small, portable electronic devices, such as cellular phones, notebook computers, cameras, and camcorders. A high-capacity secondary battery in which a plurality of battery cells are coupled to (e.g., connected to) each other in a pack structure is used as a power source for driving a motor of a hybrid electric vehicle (HEV), an electric vehicle (EV), and the like.

[0003] Several to several tens of secondary battery cells may be mounted in a battery unit and coupled to each other to form a battery pack. A plurality of battery cells may be coupled to (e.g., connected to) one another via a busbar to form the battery pack. In the secondary battery cells, aluminum or an aluminum alloy may be used as a positive electrode terminal and copper or a copper alloy may be used as a negative electrode terminal. The busbar is welded to respective negative electrode terminals and positive electrode terminals of adjacent ones of the plurality of secondary batteries to couple the plurality of secondary batteries to each other in series to form a large-capacity battery pack. However, when the busbar is made of a metal, such as copper or aluminum, it is difficult to weld different kinds of metals to each other. To overcome the problem, the busbar may be formed of clad metal including copper and/or aluminum. In this case, however, because the clad metal busbar is expensive, the manufacturing cost may increase. However, copper-copper laser welding is complicated, making it difficult to achieve the laser welding.

[0004] DE10 2010 029011 discloses a plurality of secondary batteries which are connected by busbars and discloses spot welding of the busbars to first electrode terminals of the batteries. It is also disclosed that the busbar may be connected to the battery terminals by riveting, clenching, toxing or crunching.

Summary

[0005] Aspects of the present invention seek to provide a battery pack which can reduce the manufacturing costs by using a busbar made of a single metal.

[0006] Other aspects of the present invention seek to provide a battery pack which can prevent connection failures when coupling a busbar and an electrode terminal

that are made of different kinds of metals.

[0007] The present invention provides a battery pack according to claim 1.

5 [0008] The first and second surfaces of the second electrode terminal may extend parallel with a widthwise direction of the cap plate.

[0009] The first connection part and the second connection part of the busbar may be perpendicular to each other.

10 [0010] The busbar and the second electrode terminal may be coupled to each other a clinching process, a pressing process, or a riveting process.

[0011] The busbar and the second electrode terminal may include metals that are different from each other.

15 [0012] The busbar may have a protrusion extending from a surface of the second connection portion of the busbar, and the second electrode terminal may have a recess that corresponds to the protrusion of the bus bar.

[0013] The busbar and the first electrode terminal may include the same metal.

20 [0014] The busbar and the first electrode terminal may include aluminum or an aluminum alloy.

[0015] Another embodiment of the present invention provides a method of forming a battery pack according to claim 8.

25 [0016] As described above, the battery pack according to embodiments of the present invention can reduce the manufacturing cost by using a busbar made of a single metal.

30 [0017] In addition, the battery pack according to embodiments of the present invention can prevent connection failures due to the complexities of welding different kinds of metals to each other by coupling a busbar and an electrode terminal, which are made of different kinds of metals such that welding thereof is not easy to achieve, using deformation (e.g., thermoplastic deformation) by applying pressure using a pressing device (e.g., a pressing device).

35 [0018] At least some of the above and other features of the invention are set out in the claims.

40 [0019] Additional aspects and/or characteristics of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description or may be learned by practice of the invention.

Brief Description of the Drawings

45 [0020] Objects, features, and characteristics of embodiments of the present invention will become more apparent from the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a battery pack according to an embodiment of the present invention; FIG. 2 is a perspective view of a single secondary battery of the battery pack shown in FIG. 1; FIG. 3 is an enlarged perspective view illustrating the portion 3 of FIG. 1;

FIGS. 4A and 4B are cross-sectional views taken along the lines 4a-4a and 4b-4b of FIG. 1, respectively; and

FIG. 5 is a cross-sectional view illustrating a clinching device (e.g., a TOX device) for coupling a second electrode terminal and a busbar shown in FIG. 1.

Detailed Description

[0021] Hereinafter, a battery pack according to an example embodiment of the invention will be described in detail with reference to the accompanying drawings; however, the present invention may be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the disclosure to those skilled in the art.

[0022] In the drawings, the thickness of layers and regions may be exaggerated for clarity. Like numbers refer to like elements throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. Further, the use of "may" when describing embodiments of the present invention relates to "one or more embodiments of the present invention."

[0023] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "includes," "including," "comprise," and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0024] It will be understood that, although the terms first, second, etc. may be used herein to describe various members, elements, regions, layers, and/or parts, these members, elements, regions, layers, and/or parts should not be limited by these terms. These terms are only used to distinguish one member, element, region, layer, and/or part from another member, element, region, layer, and/or part. Thus, for example, a first member, element, region, layer, and/or part discussed below could be termed a second member, element, region, layer, and/or part without departing from the teachings of the present invention.

[0025] FIG. 1 is a perspective view of a battery pack according to an embodiment of the present invention, FIG. 2 is a perspective view of a single secondary battery of the battery pack shown in FIG. 1, FIG. 3 is an enlarged perspective view illustrating the portion 3 of FIG. 1, and FIGS. 4A and 4B are cross-sectional views taken along the lines 4a-4a and 4b-4b, respectively, of FIG. 1. Hereinafter, the battery pack according to an embodiment of the present invention will be described with reference to

FIGS. 1 to 4B.

[0026] As shown in FIG. 1, the battery pack 100 includes a plurality of secondary batteries 110 and a plurality of busbars 120. While the battery pack 100 illustrated in FIG. 1 illustrates that six secondary batteries 110 are included in the battery pack 100, the number of secondary batteries included in a battery pack may vary according to the desired capacity and/or intended use of the battery pack, and aspects of the present invention are not limited thereto.

[0027] First, as shown in FIG. 2, each of the secondary batteries 110 includes an electrode assembly 111 having a first electrode plate and a second electrode plate stacked or wound with a separator therebetween, a case 112 having the electrode assembly 111 accommodated therein and having a top opening, a cap plate 113 sealing the top opening of the case 112, and electrode terminals 114 and 115 electrically coupled to (e.g., electrically connected to) the first electrode plate and the second electrode plate, respectively, and protruding to the outside of the cap plate 113.

[0028] The electrode assembly 111 is accommodated in the case 112 along with an electrolyte. The electrolyte may include an organic solvent, such as EC (ethylene carbonate), PC (propylene carbonate), DEC (diethyl carbonate), EMC (ethyl methyl carbonate), or DMC (dimethyl carbonate), and a lithium salt, such as lithium hexafluorophosphate (LiPF_6) or lithium tetrafluoroborate (LiBF_4). In addition, the electrolyte may be in a liquid, solid, or gel phase.

[0029] The case 112 may be made of a conductive metal, such as aluminum, an aluminum alloy, or nickel plated steel. In addition, the case 112 may have a hexahedron shape or another shape capable of housing (e.g., accommodating) the electrode assembly 111 in an inner space thereof.

[0030] The electrode assembly 111 is accommodated in the inner space of the case 112, and the cap plate 113 is then coupled to the top opening of the case 112. Here, the cap plate 113 may have one or more openings (e.g., holes) formed therein to allow the electrode terminals 114 and 115 to protrude to a top portion of the cap plate 113 (e.g., to protrude above the cap plate 113). A gasket 116 for electrically insulating and hermetically sealing the electrode terminals 114 and 115 may be further provided between the openings of the cap plate 113 and the electrode terminals 114 and 115.

[0031] The electrode terminals 114 and 115 include a first electrode terminal 114 electrically coupled to the first electrode plate of the electrode assembly 111 in the case 112 and a second electrode terminal 115 electrically coupled to the second electrode plate of the electrode assembly 111 in the case 112. That is to say, the first electrode terminal 114 and the second electrode terminal 115 are electrode terminals having polarities that are different from each other.

[0032] In each of the secondary batteries 110, the first electrode terminal 114 and the second electrode terminal

115 protrude to the top portion of the cap plate 113 in a state in which they have (e.g., maintain) a distance (e.g., a predetermined distance) therebetween in a lengthwise direction x of the cap plate 113. The first electrode terminal 114 and the second electrode terminal 115 have shapes that are different from each other such that the first electrode terminal 114 has one surface parallel with the cap plate 113 (e.g., a substantially flat surface parallel to a surface of the cap plate 113) and the second electrode terminal 115 has a planar surface protruding perpendicular to the cap plate 113 (e.g., the second electrode terminal extends perpendicularly with respect to the surface of the cap plate 113).

[0033] The first electrode terminal 114 has a rectangular plate shape extending in the lengthwise direction x of the cap plate 113 (e.g., the first electrode terminal 114 has a top surface that extends in the lengthwise direction x and a widthwise direction z of the cap plate 113). The first electrode terminal 114 has a first surface 114a upwardly protruding from the cap plate 113. The first surface 114a of the first electrode terminal 114 is welded to a first connection part 121 (e.g., a first connection portion) of the busbar 120. The first electrode terminal 114 is made of aluminum and/or an aluminum alloy.

[0034] The second electrode terminal 115 has a rectangular plate shape standing (e.g., extending) in an upward direction y which is perpendicular to a top surface of the cap plate 113 (e.g., the upward direction y is perpendicular to both the lengthwise direction x and the widthwise direction z). The second electrode terminal 115 is configured such that a first surface 115a and a second surface 115b that is opposite to the first surface 115a upwardly extend from and protrude above the cap plate 113. The second electrode terminal 115 is configured such that the first surface 115a faces the first electrode terminal 114. That is to say, the first surface 115a and the second surface 115b of the second electrode terminal 115 are arranged along (e.g., extend along) the widthwise direction z of the cap plate 113 which is perpendicular to the lengthwise direction x of the cap plate 113. The second electrode terminal 115 is deformed (e.g., thermally deformed) by applying pressure (e.g., predetermined pressure) thereto in a state in which it is superposed with a second connection part 122 of the busbar 120 to be coupled to (e.g., connected to) the second connection part 122. The second electrode terminal 115 may be made of copper and/or a copper alloy.

[0035] In each of the plurality of secondary batteries 110, the first electrode terminal 114 and the second electrode terminal 115 are alternately arranged such that first electrode terminals 114 and second electrode terminals 115 of adjacent secondary batteries 110 are adjacent to each other, thereby forming a terminal row. The terminal row may correspond to a line (e.g., a terminal line) formed by terminals having opposite polarities arranged along a line. That is to say, the arrangement of the plurality of secondary batteries 110 in the battery pack 100 may form two terminal rows.

[0036] The busbar 120 electrically couples the first electrode terminal 114 of each of the plurality of secondary batteries 110 to the second electrode terminal 115 of an adjacent one of the secondary batteries 110 arranged along the same terminal row. In addition, the busbar 120 electrically couples the second electrode terminal 115 of each of the plurality of secondary batteries 110 to the respective first electrode terminal 114 of an adjacent one of the secondary batteries 110 arranged along the same terminal row. That is to say, the busbar 120 electrically couples the electrode terminals 114 and 115 having polarities that are different from each other of adjacent secondary batteries 110 arranged along the same terminal row to each other.

[0037] The busbar 120 includes the first connection part 121 coupled to the first electrode terminal 114 and the second connection part 122 coupled to the second electrode terminal 115. The first connection part 121 and the second connection part 122 may be integrally formed with each other in the busbar 120. The busbar 120 includes a corner part C, that is, a bent part (e.g., a bent portion) between (e.g., coupling) the first connection part 121 and the second connection part 122. The first connection part 121 and the second connection part 122 may be bent to be perpendicular to each other (e.g., the first connection part 121 and the second connection part 122 may be bent about the corner part C). The second connection part 122 is bent at the first connection part 121 that is coupled to the first electrode terminal 114 of the secondary battery 110 and extends (e.g., extends a length or a predetermined length) to be coupled to the second electrode terminal 115 of an adjacent secondary battery 110.

[0038] The busbar 120 may be made of the same metal as that of the first electrode terminal 114 and may be made of a metal different than that of the second electrode terminal 115. For example, the busbar 120 may be made of aluminum and/or an aluminum alloy.

[0039] The first connection part 121 has a planar plate shape covering the first surface 114a of the first electrode terminal 114 that extends in the lengthwise direction x of the cap plate 113. The first connection part 121 is electrically coupled to the first surface 114a of the first electrode terminal 114 using, for example, laser welding. The first connection part 121 is melted by a laser irradiated toward a top portion of the first connection part 121 to then be coupled to the first electrode terminal 114 in a state in which it covers the first surface 114a of the first electrode terminal 114. Here, the laser irradiated toward the top portion of the first connection part 121 penetrates the first connection part 121 to reach the first surface 114a of the first electrode terminal 114, so that the melted first connection part 121 and the first electrode terminal 114 are coupled to each other as indicated by reference character A. The laser may be vertically irradiated in a circular manner (e.g., along a circular pattern) toward the top portion of the first connection part 121, but aspects of the present invention are not limited thereto. The bus-

bar 120 and the first electrode terminal 114 are made of the same metal based on flexible aluminum, thereby facilitating laser welding therebetween.

[0040] The second connection part 122 has a plate shape covering the first surface 115a of the second electrode terminal 115 that extends in the widthwise direction z of the cap plate 113. The second connection part 122 covers the first surface 115a of the second electrode terminal 115 and extends toward (e.g., extends a distance or predetermined distance toward) the first connection part 121 so that a portion of a lower corner of the second connection part 122 is coupled to the first connection part 121. That is to say, the second connection part 122 is bent at the first connection part 121 and extends (e.g., extends a length of predetermined length) to be coupled to the second electrode terminal 115.

[0041] The second connection part 122 is deformed (e.g., thermally deformed) by applying pressure (e.g., predetermined pressure) in a direction from the second surface 115b of the second electrode terminal 115 toward the first surface 115a of the second electrode 115 (e.g., a -x direction) in a state in which the second connection part 122 is superposed with the first surface 115a of the second electrode terminal 115 to be coupled to the second electrode terminal 115 (e.g., the second connection part 122 may be deformed to have a protrusion extending from a surface opposite a surface thereof contacting the first surface 115a of the second electrode 115, and the second electrode 115 may have a recess extending in the direction from the second surface 115b towards the first surface 115a). Here, a direction in which the pressure is applied to couple the second connection part 122 and the second electrode terminal 115 to each other may also be a direction from the second connection part 122 toward the second electrode terminal 115 (e.g., the x direction), but aspects of the present invention are not limited thereto.

[0042] The pressure may be applied between the second connection part 122 and the second electrode terminal 115 using one of a clinching process (e.g., a TOX® process), a pressing process, and a riveting process. For example, the TOX process may be used, which will now be described with reference to FIG. 5. TOX is a registered trademark of Pressotechnik GmbH Corporation, Riedstrasse 4 Weingarten, Germany D-88250. As shown in FIG. 5, a TOX device 10 (e.g., a clinching device) includes a TOX die 11 (e.g., a clinching die) and a TOX tool 12 (e.g., a clinching tool). The TOX tool 12 has a cylindrical protrusion part 12a provided at an approximately central portion of the TOX tool 12. However, the shape of the protrusion part 12a is not limited to the cylindrical shape illustrated. In addition, the TOX die 11 includes a receiving groove 11a for receiving the protrusion part 12a. The receiving groove 11a may be larger than the protrusion part 12a in size.

[0043] The second connection part 122 and the second electrode terminal 115 are located (or arranged) between the TOX die 11 (e.g., a receiving part) and the TOX tool

12, and the TOX tool 12 is moved toward the TOX die 11 (e.g., pressure is applied between the TOX tool 12 and the TOX die 11). Then, the second connection part 122 and the second electrode terminal 115 are indented to have shapes corresponding to the protrusion part 12a and the receiving groove 11a, respectively, to be coupled to each other. Here, a groove B (see FIG. 4B) shaped to correspond to the protrusion part 12a of the TOX tool 12 is formed in the second electrode terminal 115 and a protrusion shaped to correspond to the receiving groove 11a of the TOX die 11 may be formed in the second connection part 122.

[0044] As described above, the second electrode terminal 115 and the second connection part 122 are deformed (e.g., thermally deformed) by applying pressure thereto using a pressing device to be coupled to each other. Therefore, in the battery pack 100 according to the present invention, because the busbar 120 and the second electrode terminal 115, which are made of different kinds of metals, are coupled to each other using pressure, connection failures due to complexities of welding different kinds of metals can be prevented. In addition, in the battery pack 100 according to the present invention, because the busbar is made of a single metal, the material cost can be reduced and the manufacturing of the battery pack can be more easily facilitated.

[0045] Although the battery pack of an example embodiment of the present invention has been described in detail hereinabove, it should be understood that many variations and modifications of the basic inventive concept herein described, which may appear to those skilled in the art, will still fall within the scope of the present invention as defined by the appended claims.

Claims

1. A battery pack comprising:

a plurality of secondary batteries (110), each comprising a first electrode terminal (114) and a second electrode terminal (115) protruding from a cap plate (113); and
a plurality of busbars (120), each electrically coupling the first electrode terminal of one of the secondary batteries and the second electrode terminal of an adjacent one of the secondary batteries,
wherein the first electrode terminal (114) has a planar first surface (114a) at a top surface of the cap plate (113) and parallel with the cap plate, and
wherein the second electrode terminal (115) protrudes above the top surface of the cap plate (113), and the second electrode terminal has a planar first surface (115a) and a second surface (115b) that is opposite to the first surface, wherein the first and second surfaces of the second

- electrode terminal are perpendicular to the cap plate (113),
 wherein each of the busbars (120) comprises a first connection part (121) welded to the first surface (114a) of the first electrode terminal, and a second connection part (122) coupled to the second electrode terminal (115),
 wherein a portion of each of the busbars between the first connection part (121) and the second connection part (122) is bent, and wherein the busbars (120) and the second electrode terminals (115) are forcibly deformed to couple the second connection part (122) to the second electrode terminal (115).
2. A battery pack according to claim 1, wherein the first and second surfaces (115a, 115b) of the second electrode terminal (115) extend parallel with a widthwise direction of the cap plate (113).
 3. A battery pack of claim 1 or 2, wherein the first connection part (121) and the second connection part (122) of the busbar (120) are perpendicular to each other.
 4. A battery pack according to any preceding claim, wherein the busbar (120) and the second electrode terminal (115) comprise metals that are different from each other.
 5. A battery pack according to any preceding claim, wherein the busbar (120) has a protrusion extending from a surface of the second connection portion (122) of the busbar, and the second electrode terminal (115) has a recess that corresponds to the protrusion of the busbar.
 6. A battery pack according to any preceding claim, wherein the busbar (120) and the first electrode terminal (114) comprise the same metal.
 7. The battery pack according to claim 6, wherein the busbar (120) and the first electrode terminal (114) comprise aluminum or an aluminum alloy.
 8. A method of forming a battery pack comprising a plurality of secondary batteries (110) and a plurality of busbars (120), each of the secondary batteries comprising a first electrode terminal and a second electrode terminal,
 wherein the first electrode terminal (114) has a planar first surface (114a) at a top surface of a cap plate (113) and parallel with the cap plate, and
 wherein the second electrode terminal (115) protrudes above the top surface of the cap plate (113), and the second electrode terminal has a planar first surface (115a) and a second surface (115b) that is opposite to the first surface, wherein the first and

second surfaces of the second electrode terminal are perpendicular to the cap plate (113),
 wherein each of the busbars (120) comprises a first connection part (121), and a second connection part (122), wherein a portion of each of the busbars between the first connection part (121) and the second connection part (122) is bent,
 the method comprising:

- arranging the secondary batteries along a line such that the first electrode terminal (114) of one of the secondary batteries is adjacent to the second electrode terminal (115) of an adjacent one of the secondary batteries; and
 electrically coupling adjacent ones of the secondary batteries to each other with one of the plurality of busbars,
 wherein the electrically coupling of the ones of the adjacent secondary batteries comprises welding the first connection part (121) of the busbar (120) to the first surface (114a) of the first electrode terminal (114) of one of the adjacent secondary batteries and coupling the second connection part (122) of the busbar to the second electrode terminal (115) of another one of the adjacent secondary batteries by applying pressure to the second connection part (122) and the second electrode terminal (115) to deform them.
9. A method according to claim 8, wherein the busbars (120) and the first electrode terminals (114) comprise the same metal, and the busbars (120) and the second electrode terminals (115) comprise metals that are different from each other.
10. A method according to claim 8 or 9, wherein the first connection part (121) of the busbar (120) extends parallel to a surface of the cap plate (113), and the second connection part (122) of the busbar extends perpendicularly to the surface of the cap plate (113).
11. A method according to claim 8, 9 or 10, wherein the busbar (120) and the second electrode terminal (115) are coupled to each other by a clinching process, a pressing process, or riveting process.

Patentansprüche

1. Batteriepack, umfassend:

eine Mehrzahl von Sekundärbatterien (110),
 welche jeweils einen ersten Elektrodenanschluss (114) und einen zweiten Elektrodenanschluss (115) umfassen, welche von einer Abdeckplatte (113) vorstehen;
 und

- eine Mehrzahl von Stromschienen (120), welche jeweils den ersten Elektrodenanschluss von einer der Sekundärbatterien mit dem zweiten Elektrodenanschluss einer angrenzenden Sekundärbatterie elektrisch verbinden, wobei der erste Elektrodenanschluss (114) eine erste ebene Oberfläche (114a) an einer oberen Fläche der Abdeckplatte (113) parallel zur selben Abdeckplatte aufweist, und wobei der zweite Elektrodenanschluss (115) oberhalb der oberen Fläche der Abdeckplatte (113) vorsteht, und der zweite Elektrodenanschluss eine erste ebene Oberfläche (115a) und eine zweite Oberfläche (115b) aufweist, welche der ersten Oberfläche gegenübersteht, wobei die erste und die zweite Oberfläche des zweiten Elektrodenanschlusses zur Abdeckplatte (113) senkrecht stehen, wobei jede der Stromschienen (120) einen ersten Verbindungsteil (121), welcher mit der ersten Oberfläche (114a) des ersten Elektrodenanschlusses verschweißt ist, und einen zweiten Verbindungsteil (122) umfasst, welcher mit dem zweiten Elektrodenanschluss (115) verbunden ist, wobei ein Abschnitt jeder Stromschiene zwischen dem ersten Verbindungsteil (121) und dem zweiten Verbindungsteil (122) gebogen ist, und wobei die Stromschienen (120) und die zweiten Elektrodenanschlüsse (115) zwangsweise verformt sind, um den zweiten Verbindungsteil (122) mit dem zweiten Elektrodenanschluss (115) zu verbinden.
2. Batteriepack nach Anspruch 1, wobei die erste und die zweite Oberfläche (115a, 115b) des zweiten Elektrodenanschlusses (115) sich parallel zu einer Breitenrichtung der Abdeckplatte (113) erstrecken.
 3. Batteriepack nach Anspruch 1 oder 2, wobei der erste Verbindungsteil (121) und der zweite Verbindungsteil (122) der Stromschiene (120) zueinander senkrecht stehen.
 4. Batteriepack nach einem der vorhergehenden Ansprüche, wobei die Stromschiene (120) und der zweite Elektrodenanschluss (115) Metalle umfassen, welche voneinander unterschiedlich sind.
 5. Batteriepack nach einem der vorhergehenden Ansprüche, wobei die Stromschiene (120) einen Vorsprung aufweist, welcher sich von einer Oberfläche des zweiten Verbindungsteils (122) der Stromschiene erstreckt, und der zweite Elektrodenanschluss (115) eine Ausnehmung aufweist, welche zum Vorsprung der Stromschiene entspricht.
 6. Batteriepack nach einem der vorhergehenden Ansprüche, wobei die Stromschiene (120) und der erste Elektrodenanschluss (114) dasselbe Metall umfassen.
 7. Batteriepack nach Anspruch 6, wobei die Stromschiene (120) und der erste Elektrodenanschluss (114) Aluminium oder eine Aluminiumlegierung umfassen.
 8. Verfahren zum Bilden eines Batteriepacks, umfassend eine Mehrzahl von Sekundärbatterien (110) und eine Mehrzahl von Stromschienen (120), wobei jede der Sekundärbatterien einen ersten Elektrodenanschluss und einen zweiten Elektrodenanschluss umfasst, wobei der erste Elektrodenanschluss (114) eine erste ebene Oberfläche (114a) aufweist, welche an einer oberen Fläche einer Abdeckplatte (113) parallel zur Abdeckplatte angeordnet ist, und wobei der zweite Elektrodenanschluss (115) oberhalb der oberen Fläche der Abdeckplatte (113) vorsteht, und der zweite Elektrodenanschluss eine erste ebene Oberfläche (115a) und eine zweite Oberfläche (115b) aufweist, welche der ersten Oberfläche gegenübersteht, wobei die erste und die zweite Oberfläche des zweiten Elektrodenanschlusses zur Abdeckplatte (113) senkrecht stehen, wobei jede der Stromschienen (120) einen ersten Verbindungsteil (121) und einen zweiten Verbindungsteil (122) aufweist, wobei ein Abschnitt der Stromschiene zwischen dem ersten Verbindungsteil (121) und dem zweiten Verbindungsteil (122) gebogen ist, wobei das Verfahren umfasst:

Anordnen der Sekundärbatterien entlang einer Linie sodass der erste Elektrodenanschluss (114) einer der Sekundärbatterien an dem zweiten Elektrodenanschluss (115) einer angrenzenden anderen Sekundärbatterie angrenzt; und
Ausbilden einer gegenseitigen elektrischen Verbindung zwischen angrenzenden Sekundärbatterien über eine der Mehrzahl von Stromschienen, wobei die elektrische Verbindung der einen angrenzenden Sekundärbatterien das Schweißen des ersten Verbindungsteils (121) der Stromschiene (120) mit der ersten Oberfläche (114a) des ersten Elektrodenanschlusses (114) einer der angrenzenden Sekundärbatterien und das Verbinden des zweiten Verbindungsteils (122) der Stromschiene mit dem zweiten Elektrodenanschluss (115) einer anderen der angrenzenden Sekundärbatterien durch Aufbringen eines Druckes auf dem zweiten Verbindungsteil (122) und dem zweiten Elektrodenanschluss (115)

umfasst, um dieselben zu verformen.

9. Verfahren nach Anspruch 8, wobei die Stromschienen (120) und die ersten Elektrodenanschlüsse (114) dasselbe Metall umfassen, und die Stromschienen (120) und die zweiten Elektrodenanschlüsse (115) voneinander unterschiedliche Metalle umfassen. 5
10. Verfahren nach Anspruch 8 oder 9, wobei der erste Verbindungsteil (121) der Stromschiene (120) sich parallel zu einer Oberfläche der Abdeckplatte (113) erstreckt und der zweite Verbindungsteil (122) der Stromschiene sich senkrecht zur Oberfläche der Abdeckplatte (113) erstreckt. 10 15
11. Verfahren nach Anspruch 8, 9 oder 10, wobei die Stromschiene (120) und der zweite Elektrodenanschluss (115) miteinander durch einen Durchsatzfügevorgang, einen Pressvorgang oder einen Nietvorgang verbunden sind. 20

Revendications

1. Bloc-batterie comprenant : 25

une pluralité de batteries secondaires (110) dont chacune comprend une première borne d'électrode (114) et une seconde borne d'électrode (115) qui font saillie depuis une plaque de recouvrement (113) ; et

une pluralité de barres busbars (120) dont chacune couple électriquement la première borne d'électrode de l'une des batteries secondaires et la seconde borne d'électrode d'une adjacente des batteries secondaires ; dans lequel :

la première borne d'électrode (114) comporte une première surface plane (114a) qui est située au niveau d'une surface sommitale de la plaque de recouvrement (113) et qui est parallèle à la plaque de recouvrement ; et dans lequel :

la seconde borne d'électrode (115) fait saillie au-dessus de la surface sommitale de la plaque de recouvrement (113) et la seconde borne d'électrode comporte une première surface plane (115a) et une seconde surface plane (115b) qui est opposée à la première surface plane, dans lequel les première et seconde surfaces planes de la seconde borne d'électrode sont perpendiculaires à la plaque de recouvrement (113) ; dans lequel :

- chacun des busbars (120) comprend une première partie de connexion (121) qui est soudée sur la première surface plane (114a) de la première borne d'électrode et une seconde partie de connexion (122) qui est couplée à la seconde borne d'électrode (115) ; dans lequel :
une section de chacun des busbars entre la première partie de connexion (121) et la seconde partie de connexion (122) est fléchie, et dans lequel les busbars (120) et les secondes bornes d'électrode (115) sont déformés de façon forcée de manière à coupler la seconde partie de connexion (122) à la seconde borne d'électrode (115).
2. Bloc-batterie selon la revendication 1, dans lequel les première et seconde surfaces planes (115a, 115b) de la seconde borne d'électrode (115) sont étendues parallèlement à une direction de largeur de la plaque de recouvrement (113). 25
3. Bloc-batterie selon la revendication 1 ou 2, dans lequel la première partie de connexion (121) et la seconde partie de connexion (122) du busbar (120) sont perpendiculaires l'une à l'autre. 30
4. Bloc-batterie selon l'une quelconque des revendications qui précèdent, dans lequel le busbar (120) et la seconde borne d'électrode (115) sont constitués en des métaux qui sont différents l'un de l'autre. 35
5. Bloc-batterie selon l'une quelconque des revendications qui précèdent, dans lequel le busbar (120) comporte une protubérance qui est étendue depuis une surface de la seconde section de connexion (122) du busbar et la seconde borne d'électrode (115) comporte un évidement qui correspond à la protubérance du busbar. 40
6. Bloc-batterie selon l'une quelconque des revendications qui précèdent, dans lequel le busbar (120) et la première borne d'électrode (114) sont constitués en le même métal. 45
7. Bloc-batterie selon la revendication 6, dans lequel le busbar (120) et la première borne d'électrode (114) sont constitués en aluminium ou en un alliage d'aluminium. 50
8. Procédé de formation d'un bloc-batterie qui comprend une pluralité de batteries secondaires (110) et une pluralité de busbars (120), chacune des batteries secondaires comprenant une première borne 55

d'électrode et une seconde borne d'électrode ; dans lequel :

la première borne d'électrode (114) comporte une première surface plane (114a) qui est située au niveau d'une surface sommitale d'une plaque de recouvrement (113) et qui est parallèle à la plaque de recouvrement ; et dans lequel :

la seconde borne d'électrode (115) fait saillie au-dessus de la surface sommitale de la plaque de recouvrement (113) et la seconde borne d'électrode comporte une première surface plane (115a) et une seconde surface plane (115b) qui est opposée à la première surface plane, dans lequel les première et seconde surfaces planes de la seconde borne d'électrode sont perpendiculaires à la plaque de recouvrement (113) ; dans lequel :

chacun des busbars (120) comprend une première partie de connexion (121) et une seconde partie de connexion (122), dans lequel une section de chacun des busbars entre la première partie de connexion (121) et la seconde partie de connexion (122) est fléchie, le procédé comprenant :

l'agencement des batteries secondaires suivant une ligne de telle sorte que la première borne d'électrode (114) de l'une des batteries secondaires soit adjacente à la seconde borne d'électrode (115) d'une adjacente des batteries secondaires ; et le couplage électrique de celles adjacentes des batteries secondaires les unes aux autres à l'aide de l'un de la pluralité de busbars ; dans lequel :

le couplage électrique de celles considérées des batteries secondaires adjacentes comprend le soudage de la première partie de connexion (121) du busbar (120) sur la première surface plane (114a) de la première borne d'électrode (114) de l'une des batteries secondaires adjacentes et le couplage de la seconde partie de connexion (122) du busbar sur la seconde borne d'électrode (115) d'une autre des

batteries secondaires adjacentes en appliquant une pression sur la seconde partie de connexion (122) et sur la seconde borne d'électrode (115) de manière à les déformer.

9. Procédé selon la revendication 8, dans lequel les busbars (120) et les premières bornes d'électrode (114) sont constitués en le même métal et les busbars (120) et les secondes bornes d'électrode (115) sont constitués en des métaux qui sont différents l'un de l'autre.

10. Procédé selon la revendication 8 ou 9, dans lequel la première partie de connexion (121) du busbar (120) s'étend parallèlement à une surface de la plaque de recouvrement (113) et la seconde partie de connexion (122) du busbar est étendue perpendiculairement à la surface de la plaque de recouvrement (113).

11. Procédé selon la revendication 8, 9 ou 10, dans lequel le busbar (120) et la seconde borne d'électrode (115) sont couplés l'un à l'autre au moyen d'un processus de clinchage, d'un processus de pression ou d'un processus de rivetage.

FIG. 1

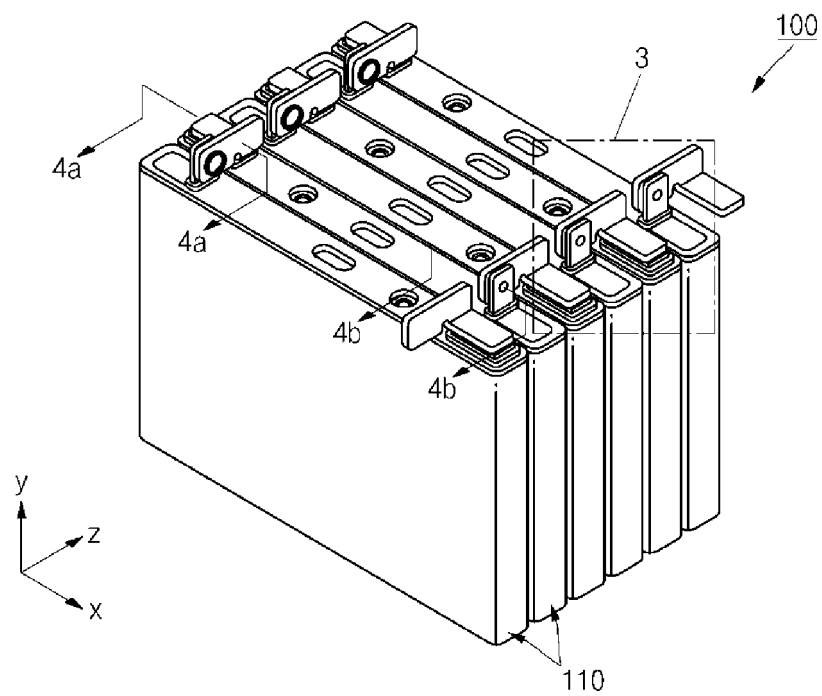


FIG. 2

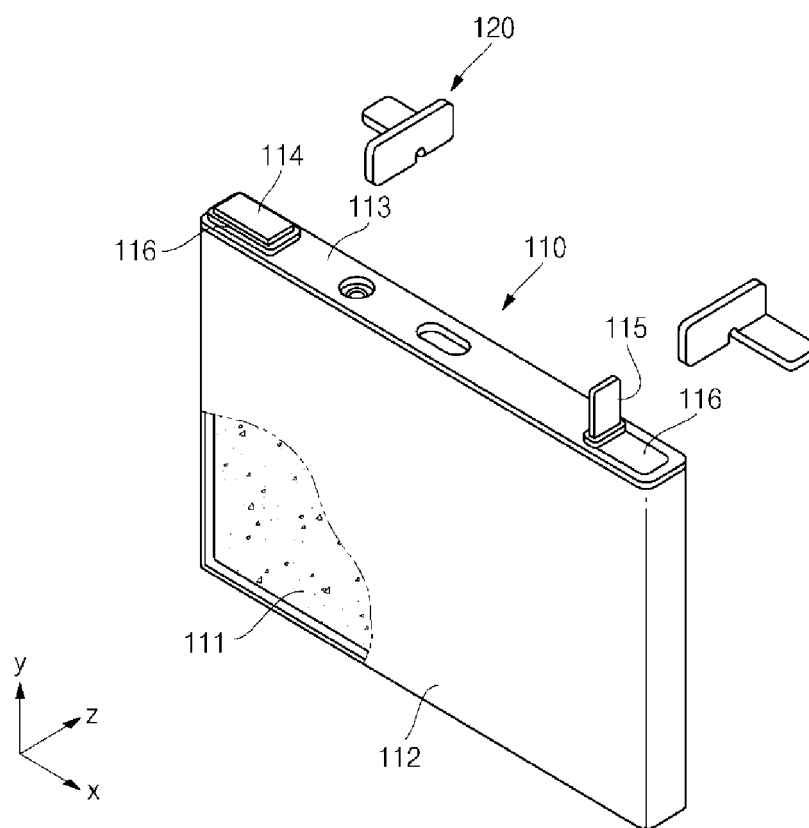


FIG. 3

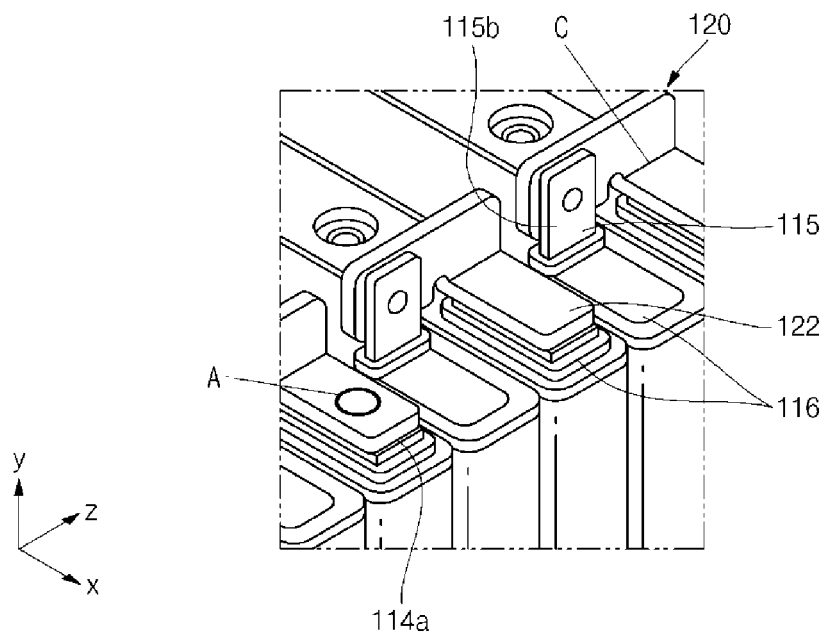


FIG. 4A

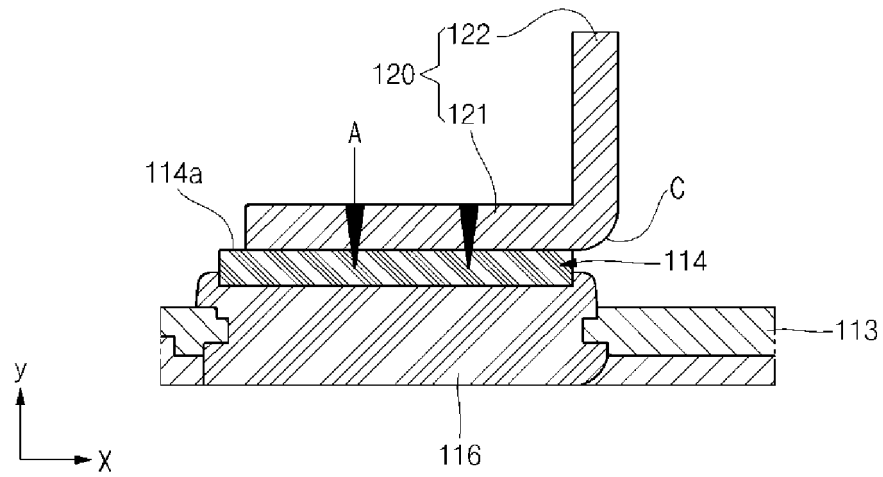


FIG. 4B

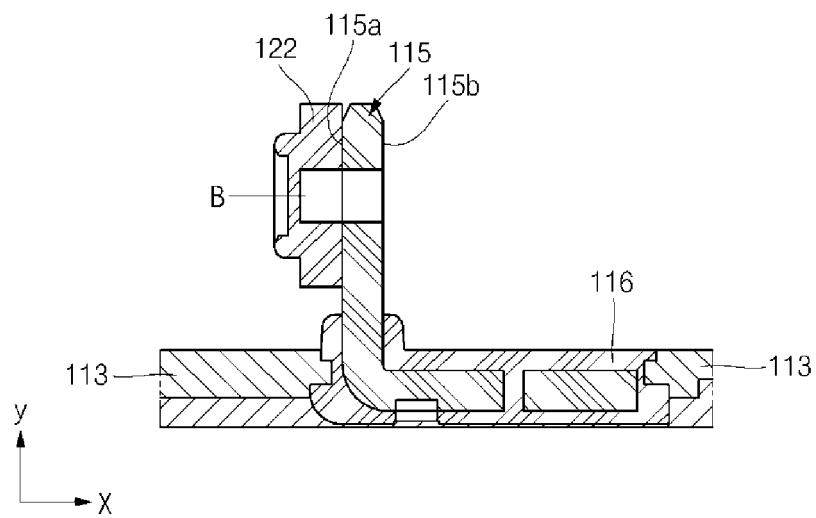
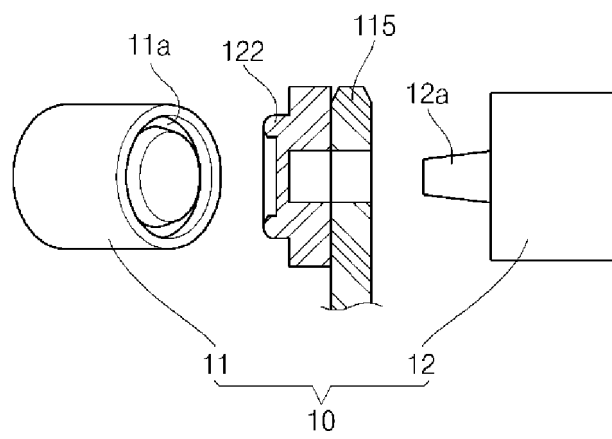


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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